

**REMARKS**

***Amendment summary***

Claim 1 is amended to recite that the electroplating process is performed to a predetermined plating thickness. Support for this amendment may be found, e.g., in the paragraph bridging pages 24 and 25, and on page 33, lines 17-30 of the present specification.

No new matter is added by this Amendment, and Applicant respectfully requests entry of the Amendment.

***Status of the claims***

Claim 1 was rejected under 35 U.S.C. § 112 as allegedly being indefinite. Claim 1 was also rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable based on Ellis (GB 2214520).

***Response to rejection under 35 U.S.C. § 112***

Applicant respectfully submits that the claim as previously written was clear and definite. However, in the interests of furthering prosecution, Applicant submits that claim 1, which recites that the electroplating process is performed to a predetermined plating thickness, renders this rejection moot.

Applicant notes that the presently claimed invention is provides an electroplating process which, by utilizing a constant-voltage pulse process, is capable of providing an electroplated metal layer having good crystallinity and uniform deposition on a substrate surface, with low equipment cost. A person having ordinary skill in the art would understand that the end point of

the electroplating process is the point in time where the electroplated metal film has grown to a targeted thickness.

Applicant respectfully requests that the Examiner specifically and clearly point out how the claim is indefinite in the event that the Examiner maintains this rejection.

The reconsideration and withdrawal of this rejection is respectfully requested.

***Response to rejection under 35 U.S.C. § 103 based on Ellis***

Claim 1 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable based on Ellis (GB 2214520). Applicant respectfully submits that the presently claimed invention is not anticipated by or rendered obvious by Ellis because given the teachings of Ellis, a person having ordinary skill in the art would not have a reason to arrive at the presently claimed invention, nor would they have expected that the presently claimed invention would produce plated metal films having a higher degree of crystallinity. In addition, the rejection as set forth in the Office Action was facially deficient for failing to address the voltage time/interruption time characteristics of the present claims.

Claim 1 presently recites an electroplating process of electroplating an electrically conductive substrate comprising electroplating intermittently to a predetermined plating thickness using the substrate surface as a cathode and a plating metal as an anode at a constant voltage between the anode and the cathode by repeating application of a voltage between a cathode and an anode and interruption of the application alternately. The voltage time/interruption time ratio is 0.1 to 1.0, the voltage time is not longer than 10 seconds, and the interruption time is not less than  $1 \times 10^{-12}$  seconds.

The recited voltage time/interruption time ratio of 0.1 to 1.0 means that the interruption time is equal to or longer than the voltage time. The voltage interruption permits the metal ions around the interface of the substrate to diffuse, which in turn maintains a constant concentration of metal ions at all times. This means that no defect will occur in the crystal lattice of the precipitated metal layer, and thus a higher degree of crystallinity is obtained. The intermittent voltage application permits a the formation of an electrodeposition having a highly uniform thickness in the marginal or central area of, for example, the substrate board surface. The present invention aims to further improve the crystallinity of the plated metal film by defining the interruption time to be as long or longer than the voltage time.

Applicant respectfully submits that Ellis does not render the presently claimed invention obvious because Ellis discloses its conditions of independent-variable reversed voltage as follows: forward at 2 amps for 10 msec. and reverse at 7 amps for 0.5 msec. (see Example 1 of Ellis); and forward at 3 amps for 10 msec. and reverse at 5 amps for 1 msec. (see Example 2 of Ellis). In other words, Ellis discloses a relationship between the voltage time and the interruption time that is the reverse of the presently claimed invention. Following the disclosure in Ellis, a person having ordinary skill in the art would not have a reason to arrive at the presently claimed invention, nor would they have expected that the presently claimed invention would produce plated metal films having a higher degree of crystallinity.

Applicant also respectfully submits that the rejection based on Ellis was improper and did not form a proper *prima facie* case of obviousness because it did not point to any disclosure in any cited reference of (1) a voltage time/interruption time ratio of 0.1 to 1.0; (2) a voltage time of not longer than 10 seconds; and (3) an interruption time of not less than  $1 \times 10^{-12}$  seconds. Without addressing these elements, this rejection is improper and should be withdrawn.

With respect to the position in the Office Action that the presently recited voltage time/interruption time characteristics are “design choices,” Applicant respectfully submits that this is incorrect, and that this is not the proper basis for a §103 rejection. First, Applicant notes that the Office Action has not carried its burden - nowhere in the Office Action is there any support for this position. As a result, this is another example of how this rejection does not form a *prima facie* case of obviousness against the claims. Second, the Office Action has not set forth a reason why a person having ordinary skill in the art would alter the teachings in Ellis to arrive at the presently claimed invention. Absent that rationale, it is improper to dismiss a claim element as merely a “design choice.” Again, the Office Action has not carried its required burden to show a *prima facie* case of obviousness.

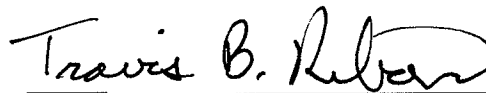
Applicant therefore respectfully submits that the presently claimed invention is not anticipated by or rendered obvious by Ellis, and respectfully requests the reconsideration and withdrawal of this § 103 rejection.

### ***Conclusion***

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

A handwritten signature in black ink, reading "Travis B. Ribar", written over a horizontal line.

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